

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Giovanni Frezza
Application No. : 09/997,995
Filed : November 30, 2001
For : METHOD FOR FORMING A PROTECTIVE PACKAGE FOR
ELECTRONIC CIRCUITS
Examiner : Ori Nadav
Art Unit : 2811
Docket No. : 856063.722
Date : January 8, 2007

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANT'S BRIEF

Commissioner for Patents:

This brief is in furtherance of the Notice of Appeal, filed in this case on August 28, 2006. The fees required under Section 1.17(c), and any required request for extension of time for filing this brief and fees therefor, are dealt with in the accompanying transmittal letter.

I. REAL PARTY IN INTEREST

STMicroelectronics S.r.l. is the assignee of the present application and is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

None.

III. STATUS OF CLAIMS

Claims 19, 21-22, 24, 27-29, 31-33, 36, 38, and 40-43 are pending. Claims 19, 21-22, 24, 27-29, 31-33, 36, and 38 were rejected. Claims 40-43 were not addressed by the Examiner. Claims 1-18, 20, 23, 25-26, 30, 34-35, 37, and 39 were canceled. Claims 19, 21-22, 24, 27-29, 31-33, 36, and 38 are being appealed.

IV. STATUS OF AMENDMENTS

No amendments were filed subsequently to the final Office Action of May 31, 2006.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention relates to a plastic protective package for integrated electronic devices, the package being formed with a window so that the contained electronic devices can at least partially be accessed from the outside of the package. A prior art packaged electronic device is shown in Figure 1 of the application (reproduced below) and includes a package 1 and a support 2 for an integrated circuit. The integrated circuit includes a pressure sensor 3 and control circuitry 4 that are fixed on the support 2 by an adhesive layer 5. The sensor 3 and control circuitry 4 are covered with a coating gel 6 and the package 1 is closed by a closing element 7 with a window 8 aligned with the sensor 3. The prior art device shown in Figure 1 has some drawbacks in that, to complete the device, it is necessary firstly to form the package, insert the components into the package, seal the package, and insert the element or operating the sensor through the package window. Also with such devices, the procedure for aligning and positioning the window 8 to insert the element operating the sensor is troublesome, and this makes the device construction difficult to reproduce.

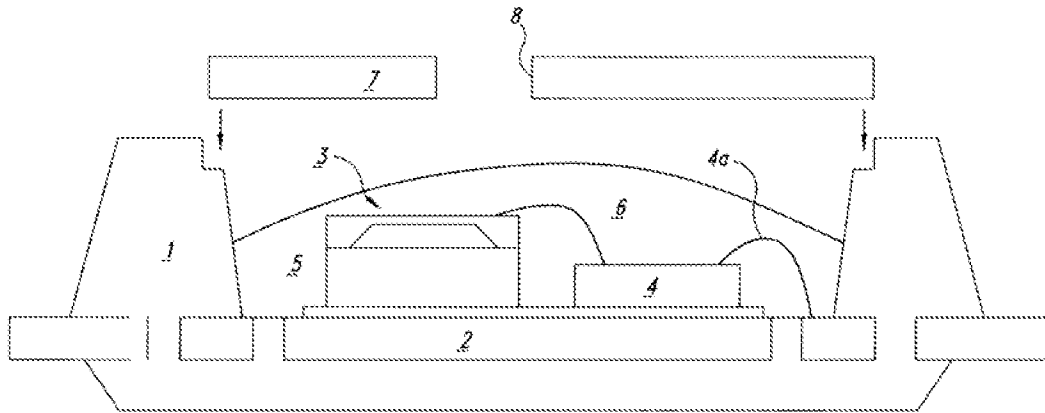


FIG. 1

One of the concepts behind embodiments of this invention is that of forming a package using a conventional molding technique, and provide it with a window aligned to a sensor housed inside the package, but in communication with the package exterior. After having fixed the sensor and a control circuit on a support, a surface of the sensor is covered with a covering layer made out of elastic material so as to form a projecting portion from the device surface. The support is inserted into a mold in such a way that the projecting portion abuts against the superior wall of the mold, when the mold is closed. The mold is then filled with an insulating material to form the package with its window in a single step. Advantageously, the mold contacts the projecting portion, such that a window, aligned with the sensor, is formed during molding of the package.

The invention includes at least two embodiments: one shown in Fig. 2B and one shown in Figure 8. The embodiment of Figure 2B (reproduced below) shows a ring-shaped dyke or barrier 52 surrounding an elastic projecting portion 51 over a sensor 30, such that the sensor 30 can be activated by exerting pressure on the projecting portion 51. The embodiment shown in Figure 8 (reproduced below) shows a ring-shaped projecting portion 51 that enables the sensor 30 to be activated through a central hole in the projecting portion 51.

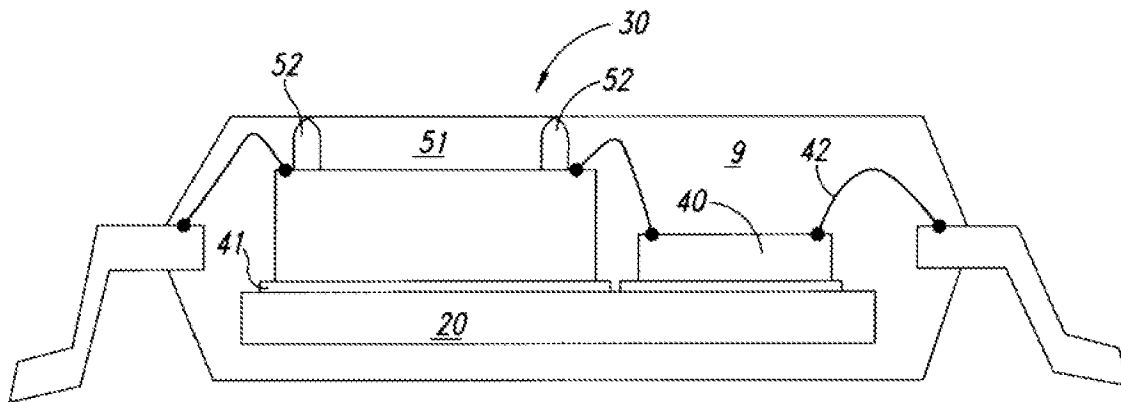


FIG. 2B

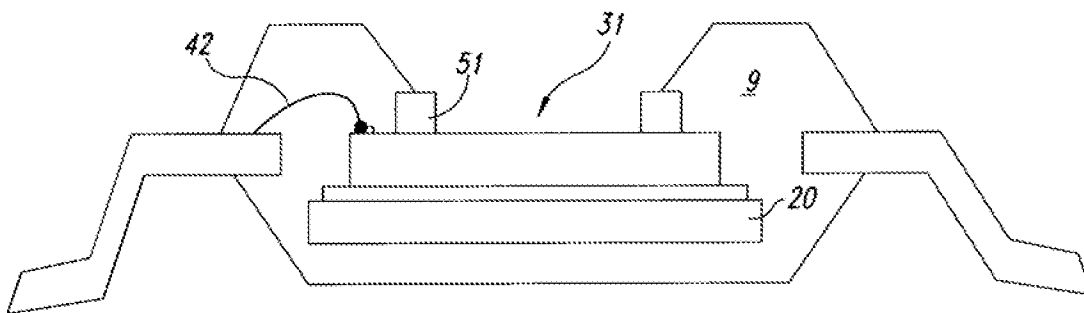


FIG. 8

The following shows exemplary claims 19 and 22 with reference numbers indicating those claims being read on Figures 8 and 2B, respectively. Of course, the reference numbers are exemplary only and are not intended to limit the claims only to the exact embodiments shown in Figures 8 and 2B.

19. A packaged electronic device ready for electronic use, comprising:
a semiconductor-integrated electronic circuit including a pressure sensor 30 (page 4, lines 2-3);
a plastic protective package 9 surrounding and supporting the electronic circuit, the protective package having a window 70 over the pressure sensor 30 of the electronic device (page 8, lines 1-5) such that the pressure sensor can be at least partially activated from outside of

said protective package (page 5, lines 1-2; page 7, lines 11-15; Figs. 6 and 8; original claim 19); and

a projecting portion 51 of elastic material projecting from a surface of the electronic device into the window (page 7, lines 3-5), the projecting portion being structured to enable the pressure sensor to be activated through the projecting portion when the electronic device is in use (page 8, lines 8-10), wherein said projecting portion is shaped to form a ring on the electronic circuit (page 7, lines 22-25).

22. A packaged electronic device ready for electronic use, comprising:

a semiconductor-integrated electronic circuit 30 (page 4, lines 2-3);

a plastic protective package 9 surrounding and supporting the electronic circuit, the protective package having a window 70 over a portion of the electronic device such that the electronic device can be at least partially activated from outside of said protective package (page 5, lines 1-2 and 11-13; page 7, lines 11-15; Figs. 2B and 6); and

a projecting portion 51 of elastic material projecting from a surface of the electronic device into the window, the projecting portion being structured to enable the electronic device to be activated through the projecting portion when the electronic device is in use, wherein said projecting portion is surrounded by dyke or barrier 52 formed on a surface of the electronic circuit (original claim 22; page 4, lines 14-17; Fig. 2B)¹.

27. A packaged electronic device ready for electronic use, comprising:

a semiconductor-integrated electronic circuit including a pressure sensor 30 (page 4, lines 2-3);

a plastic protective package 9 surrounding and supporting the electronic circuit, the protective package having a window 70 over the pressure sensor 9 (page 8, lines 1-5) such that the pressure sensor can be activated from outside of said protective package (page 5, lines 1-2; page 7, lines 11-15; Figs. 6 and 8; original claim 19); and

¹ Note that page 4, lines 14-17 and Fig. 2B were amended in the Amendment filed on December 3, 2002. The Figure 2B reproduced above is the “as amended” version.

an elastic protective layer 51 positioned in the window 70 (page 7, lines 3-5), the protective layer being structured to enable the pressure sensor to be activated through the protective layer when the electronic device is in use (page 8, lines 8-10), wherein the protective layer is shaped to form a ring on the electronic circuit (page 7, lines 22-25).

29. A packaged electronic device ready for electronic use, comprising:

a semiconductor-integrated electronic circuit 30 (page 4, lines 2-3);

a plastic protective package 9 surrounding and supporting the electronic circuit, the protective package having a window 70 over a portion of the electronic device such that the electronic device can be activated from outside of said protective package (page 5, lines 1-2 and 11-13; page 7, lines 11-15; Figs. 2B and 6); and

an elastic protective layer 51 positioned in the window, the protective layer being structured to enable the electronic device to be activated through the protective layer when the electronic device is in use, wherein the protective layer is surrounded by dyke or barrier 52 formed on a surface of the electronic circuit (original claim 22; page 4, lines 14-17; Fig. 2B).

31. A packaged electronic device ready for electronic use, comprising:

a semiconductor-integrated electronic circuit 30 having a top, a bottom, and lateral sides extending between the top and bottom (page 4, lines 2-3);

an elastic protective layer 51 positioned on the circuit (page 4, lines 8-12), the protective layer being structured to enable the electronic device to be activated through the protective layer when the electronic device is in use (page 8, lines 8-10); and

a plastic protective package 9 in which the electronic circuit is embedded, the protective package supporting the electronic circuit and contacting the lateral sides of the electronic circuit, the protective package having a window 70 over a portion of the electronic circuit such that the electronic circuit can be activated from outside of said protective package (page 5, lines 1-2 and 11-13; page 7, lines 11-15; Figs. 2B and 6), wherein the protective layer is surrounded by dyke or barrier 52 formed on a surface of the electronic circuit (original claim 22; page 4, lines 14-17; Fig. 2B).

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Claims 22, 29, 31-33, 36, and 38 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

Claims 22, 29, 31-33, 36, and 38 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement.

Claims 19, 21-22, 24, 27-29, 31-33, 36, and 38 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 4,894,707 to Yamawaki et al. (“Yamawaki”) in view of U.S. Patent No. 5,948,991 to Nomura et al. (“Nomura”).

VII. ARGUMENT

A. *Written Description/Enablement*

To support the written description and enablement rejections, the Examiner bears the initial burden of establishing that the written description in the specification is inadequate to enable any person skilled in the art to make and use the invention. To establish a *prima facie* case of lack of enablement, the Examiner “bears the burden of setting forth a reasonable explanation as to why it believes that the scope of protection by that claim is not adequately enabled by the description of the invention provided in the specification of the application; this includes, of course, providing sufficient reasons for doubting any assertions in the specification as to the scope of enablement.” *In re Wright*, 999 F.2d 1557, 1561-1562 (Fed. Cir. 1993). Regarding written description, the Examiner must establish that the disclosure of the application does not reasonably convey to a person of ordinary skill in the art that the inventor had possession of the invention when the application was filed. *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563-1564 (Fed. Cir. 1991).

The Examiner has not established a *prima facie* case of lack of written description or non-enablement, because the Examiner has not provided any reasons in support of the rejections. Instead, the Examiner has merely stated his conclusion that “There is no adequate description in the disclosure how to form a device comprising a protective package having a window over the pressure sensor of the electronic device and an electronic device activated

through a projecting portion wherein the projecting portion is shaped to form a ring or is surrounded by dyke or barrier and formed on a surface of the electronic device, as recited in claims 22, 27, 29, and 31, in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.” Such a conclusory statement merely quotes from the claim and Section 112 without providing any reasons in support.

The applicants also submit that the Examiner’s Response to Arguments on pages 5-6 of the May 31, 2006 Office Action does not provide reasons in support of the non-enablement and lack of written description rejections. First, the Examiner misquoted claims 22, 27, 29, and 31 by implying that those claims recite “wherein the projecting portion is shaped to form a ring” and that the “ring shaped dyke or barrier is formed to be embedded inside the protective layer.” Instead, claim 22, for example, recites that “projecting portion is surrounded by dyke or barrier formed on a surface of the electronic circuit.” Second, the Examiner underlined the words “through” and “window”, but did not provide any reason why “through” and “window” were not enabled or supported by a written description.

For the foregoing reasons, the Examiner has not established a prima facie case of non-enablement or lack of written description, and thus, the Section 112 rejections should be withdrawn.

The language of claims 22, 29, 31-33, 36, and 38 is supported by an adequate written description that enables one skilled in the art to make and use the invention. The applicant disagrees with the assertion that the disclosure does not support the above-quoted language of claim 22 regarding a projecting portion being surrounded by a dyke or barrier and projecting into a window of the package. Page 4, lines 14-17 and original claim 22 both describe a dyke surrounding a projecting portion of elastic material that extends into a window of the protective package.² In addition, page 6, line 16 – page 7, line 13 describe in detail the formation of a projecting portion 51 within a dyke and the formation of a protective package 9 with a window 70 that surrounds the dyke and projecting portion as shown in Figures 2A-2B. One of ordinary skill in the art would recognize that, by extending the projecting portion 51 and

² The language regarding the projecting portion extending into the window of the package is found in original claim 19, from which original claim 22 depended.

the dyke 52 completely to the upper mold 120 (Fig. 2A), a window will inherently be formed in the resulting plastic package 9 of Figure 2B.³

The applicant also disagrees with the assertion that the disclosure does not support the above-quoted language of claim 22 regarding the electronic device being activated through the projecting portion. Support for the activation of the electronic device through the projecting portion can be found throughout the entire specification and figures. The main purpose of the entire invention is to enable an electronic device 30 to be activated through the projecting portion 50/51. The specification repeatedly reports that projecting portion is aligned with both a window 70 of a protective package 9 and with the electronic device/sensor 30 (e.g., p. 4, lines 8-19; p. 5, lines 6-13; p. 7, lines 1-13). The specification further indicates that the projecting portion 50/51 can be elastic and/or transparent (p. 4, lines 9-13; p.7, line 19). In addition, each of Figures 2B, 4-6, and 8 shows the projecting portion 50/51 aligned with the package window 70 and the electronic device/sensor 30. One of ordinary skill in the art would easily recognize that the electronic device/sensor is activated through the projecting portion 50/51 and window 70.

For the reasons expressed above, claims 22, 29, 31-33, 36, and 38 are supported by an enabling written description of the invention with the meaning of 35 U.S.C. § 112, first paragraph.

B. Nonobviousness

The Federal Circuit has held many times that the Examiner must provide objective evidence of a motivation for combining the teachings of cited references in the manner claimed. *E.g., In re Sang-Su Lee*, 277 F.3d 1338, 1343; 61 USPQ2d 1430, 1433 (Fed. Cir. 2002) (copy enclosed). Further, “this factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority.” *Id.* at 277 F.3d 1343-1344; 61 USPQ2d 1433. Moreover, “the mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification.” *In re Fritch*, 972 F.2d 1260, 1266; 23 USPQ2d 1780, 1783-84.

³ Note that the term “window” can simply be an opening in the package 9.

Nomura and Yamawaki do not teach or suggest the invention recited in claim 19, as amended. In particular, claim 19 recites a packaged electronic device that includes an electronic circuit with a pressure sensor, and ring-shaped, elastic projection portion that projects from a surface of the device into a window to enable the pressure sensor to be activated through the projection portion when the device is in use. Nomura and Yamawaki do not teach or suggest such a ring-shaped projecting portion for a pressure sensor circuit.

There is no motivation in the prior art for combining Nomura and Yamawaki to create the claimed invention. Nomura shows a pressure-sensitive chip 130 with a gel-like protective member 132 covering the entire top of the chip 130 (Fig. 6). Yamawaki shows an image sensor 1, a glass window pane 2, 12, and an enclosed wall 3 that extends between the image sensor and the glass window (Fig. 2g). The reason that the wall 3 is ring-shaped is obvious: to allow the image sensor an unobstructed view through the space that is enclosed by the wall 3. Such an unobstructed view is irrelevant for a pressure sensor like the chip 130 of Nomura. Thus, the prior art does not provide any motivation for adding the pressure-sensitive chip 130 of Nomura to a ring shape like the wall 3 of Yamawaki.

The applicants respectfully disagree with the motivation given by the Examiner for combining Yamawaki with Nomura. The Examiner states that it would have been obvious to replace the optical device 1 of Yamawaki with the pressure-sensitive chip 130 of Nomura in order to use the device in an application that requires a pressure sensor chip. This is incorrect for several reasons. First, the Yamawaki device includes a rigid glass window pane 12 that would prevent proper operation of the device if the optical device 1 of Yamawaki were replaced with the pressure-sensitive chip 130 of Nomura. That is, the rigidity of the glass window pane 12 and the empty space between the window pane 12 and the device 1 of Yamawaki, would not allow any pressure to reach the device 1, assuming that the device 1 were replaced with the pressure-sensitive chip 130 of Nomura. Nothing in Yamawaki or Nomura would motivate one to remove the glass window pane 12 because Nomura teaches one to always protect the pressure-sensitive chip from contamination.

Second, even if one could modify Yamawaki with Nomura, the case law and the MPEP make clear that the mere fact that references can be combined or modified is not sufficient to establish obviousness. As stated in MPEP 2143.01(III), “the mere fact that

references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Nothing in the prior art suggests the desirability of replacing the Yamawaki optical chip 1 with the Nomura pressure-sensitive chip 130. The Examiner does not explain why, if faced with an application that requires a pressure sensor chip, one would not simply use the entire Nomura pressure sensor device rather than trying to modify the Yamawaki optical device to become a pressure sensor.

Third, the Examiner's proposed change to the Yamawaki device would improperly render the Yamawaki device unsatisfactory for its intended purpose. As stated in MPEP 2143.01(V), "If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)" The proposed modification of Yamawaki to replace the optical chip 1 with the pressure-sensitive chip 130 of Nomura would improperly render the Yamawaki device unsatisfactory for its intended purpose as an optical device.

For the foregoing reasons, claim 19 is nonobvious in view of Nomura and Yamawaki. Claims 21 and 24 depend on claim 19, and thus, are also nonobvious.

Although the language of claim 27 differs from that of claim 19, the allowability of claim 27 will be apparent in view of the above discussion.

Yamawaki and Nomura do not teach or suggest the invention recited in claim 22. Claim 22 recites that the device includes a dyke or barrier that surrounds an elastic projection portion and is formed on a surface of an electronic circuit. The Examiner asserts that the wall 3 of Yamawaki is such a dyke or barrier, the elastic material 132 of Nomura is a projecting portion, and the combination of them would create the invention. The motivation provided by the Examiner is that the elastic material 132 would provide better protection for the chip.

Regardless of whether there would have been a motivation for combining Yamawaki and Nomura, the resulting device would not satisfy the language of claim 22 for several reasons. First, the combination of Yamawaki and Nomura would not include a dyke or barrier that surrounds an elastic projection portion. Instead, the protective member 132 of Nomura extends across the entire top surface of the device 130 while the elastic wall 3 of

Yamawaki is positioned interiorly of the edges of the device 1. As such, the protective member 132 would completely cover the elastic wall 3 on three sides, and thus, the elastic wall 3 would not surround the protective member 132.

Second, the prior art does not provide any suggestion to use both the elastic wall 3 of Yamawaki and the protective member 132 of Nomura rather than replacing the elastic wall 3 with the protective member 132 or replacing the protective member 132 with the elastic wall 3. The only reasons mentioned by Yamawaki for the elastic wall 3, to protect the device 1 during molding and to support the glass layer 2, are not applicable to any device that incorporates the protective member 132 of Nomura, and thus, there is no reason in the prior art to include both the elastic wall 3 and the protective member 132. Only an improper hindsight reconstruction based on the applicants' disclosure provides such a suggestion.

Third, there is no suggestion that the elastic material of Nomura could or should be used to provide better protection to the Yamawaki device. The glass window pane 12 of Yamawaki already closes the opening in the resin package 9, so there is no need to add the elastic material 132 of Nomura to the Yamawaki device. Certainly, neither Yamawaki nor Nomura suggests such a "belt and suspenders" approach. In addition, Nomura does not teach or suggest that the elastic material 132 is transparent at all, let alone transparent enough to be incorporated into the optical device of Yamawaki, and thus, one would not be motivated to use the Nomura elastic material instead of, or in addition to, the glass window pane 12 of Yamawaki.

The applicants submit that the Examiner is improperly using hindsight, based on the applicants disclosure, to pick and choose from the prior art, to obtain the claimed invention. To obtain the claimed invention from Yamawaki and Nomura, one would need to 1) replace the Yamawaki optical device 1 with the Nomura pressure sensor 130; 2) choose to add the Nomura protective member 132; 3) shrink the Nomura protective member 132 to fit within the Yamawaki ring-shaped wall 3; and 4) remove the rigid glass pane 12 of Yamawaki. There no motivation in the prior art to do all of those things or an explanation of how to accomplish them.

For the foregoing reasons, claim 22 is nonobvious in view of the cited prior art.

Although the language of claims 29, 31-33, 36, and 38 differs from that of claim 22, the allowability of claims 29, 31-33, 36, and 38 will be apparent in view of the above discussion.

VIII. CLAIMS APPENDIX

19. A packaged electronic device ready for electronic use, comprising:
a semiconductor-integrated electronic circuit including a pressure sensor;
a plastic protective package surrounding and supporting the electronic circuit, the protective package having a window over the pressure sensor of the electronic device such that the pressure sensor can be at least partially activated from outside of said protective package; and
a projecting portion of elastic material projecting from a surface of the electronic device into the window, the projecting portion being structured to enable the pressure sensor to be activated through the projecting portion when the electronic device is in use, wherein said projecting portion is shaped to form a ring on the electronic circuit.

21. The packaged electronic device according to claim 19 wherein said window has tapering walls toward said electronic circuit.

22. A packaged electronic device ready for electronic use, comprising:
a semiconductor-integrated electronic circuit;
a plastic protective package surrounding and supporting the electronic circuit, the protective package having a window over a portion of the electronic device such that the electronic device can be at least partially activated from outside of said protective package; and
a projecting portion of elastic material projecting from a surface of the electronic device into the window, the projecting portion being structured to enable the electronic device to be activated through the projecting portion when the electronic device is in use, wherein said projecting portion is surrounded by dyke or barrier formed on a surface of the electronic circuit.

24. The packaged electronic device of claim 19 wherein the electronic circuit includes a proximity sensor.

27. A packaged electronic device ready for electronic use, comprising:

a semiconductor-integrated electronic circuit including a pressure sensor;
a plastic protective package surrounding and supporting the electronic circuit, the protective package having a window over the pressure sensor such that the pressure sensor can be activated from outside of said protective package; and
an elastic protective layer positioned in the window, the protective layer being structured to enable the pressure sensor to be activated through the protective layer when the electronic device is in use, wherein the protective layer is shaped to form a ring on the electronic circuit.

28. The packaged electronic device of claim 27 wherein the window has walls tapering toward said electronic circuit.

29. A packaged electronic device ready for electronic use, comprising:
a semiconductor-integrated electronic circuit;
a plastic protective package surrounding and supporting the electronic circuit, the protective package having a window over a portion of the electronic device such that the electronic device can be activated from outside of said protective package; and
an elastic protective layer positioned in the window, the protective layer being structured to enable the electronic device to be activated through the protective layer when the electronic device is in use, wherein the protective layer is surrounded by dyke or barrier formed on a surface of the electronic circuit.

31. A packaged electronic device ready for electronic use, comprising:
a semiconductor-integrated electronic circuit having a top, a bottom, and lateral sides extending between the top and bottom;
an elastic protective layer positioned on the circuit, the protective layer being structured to enable the electronic device to be activated through the protective layer when the electronic device is in use; and
a plastic protective package in which the electronic circuit is embedded, the protective package supporting the electronic circuit and contacting the lateral sides of the

electronic circuit, the protective package having a window over a portion of the electronic circuit such that the electronic circuit can be activated from outside of said protective package, wherein the protective layer is surrounded by dyke or barrier formed on a surface of the electronic circuit.

32. The device of claim 31 wherein the protective package also contacts the top of the electronic circuit adjacent to the window.

33. The device of claim 31 wherein the window is define by tapering walls that taper inwardly toward said electronic circuit.

36. The device of claim 31 wherein the electronic circuit includes a proximity sensor.

38. The device of claim 31 wherein the protective layer is shaped to form a ring on the electronic circuit.

40. The device of claim 22 wherein the window is defined by tapering walls that taper inwardly toward said electronic circuit.

41. The device of claim 22 wherein the electronic circuit includes a proximity sensor.

42. The device of claim 29 wherein the window is defined by tapering walls that taper inwardly toward said electronic circuit.

43. The device of claim 29 wherein the electronic circuit includes a proximity sensor.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.

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